Motorola
newsgram
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Communications and Electronics Division.

Jan. - Feb., 1956

In this issue . . . Expanded facilities in Mexico for sale and service of Motorola 2-way radio will aid such users as the Federal Highway Police . . . Page 12

Fabrication By Diffusion

D. E. NOBLE

In the last discussion, I pointed out that the lid has been removed from the transistor frequency response by the perfection of a method of processing which utilizes the process of diffusing the doping material into the crystal slab. This is a substitute for the alloying processes or the etching and plating process. The first announcement of the successful fabrication of transistors by the diffusion process came from the Bell Laboratories at a devices meeting in Philadelphia a few months ago. The second announcement came from Motorola. At our Motorola Solid State Physics Laboratories in Phoenix, Arizona, we have been working with the diffusion doping process for many months. We have now placed in successful limited laboratory pilot production, a diffused base transistor of excellent characteristics. Our experience with this new technique satisfies me beyond a doubt that we are working with an entirely new category of dimensions far removed from that which limited the performance characteristics of the old type transistors. Practical frequency cut-offs with the new technique appear to be possible in the range of 500 to 1000 Mc., with the feedback capacitance of the device limited to a fraction of a micromicrofarad.

Based upon our experience with the ease and precision of manufacturing control, I feel impelled to state flatly that the diffused base transistor renders obsolete all other types of low power level transistors. This substantial extension of frequency response is the break-through every circuit man has been waiting for; from here on out, it is only a question of time for transistors to replace vacuum tubes in military, industrial and consumer electronic products for all low power level circuitry applications. I said it is a question of time. I do not wish to imply that the successful laboratory production of the device heralds an immediate changeover to transistors in our mobile equipment or in any other equipment. There is always a delay of several years from laboratory pilot production to successful low-cost, semi-automatic mass production. Successful product application cannot be achieved until it is backed by the production of uniform transistors in quantities.

Most optimists will expect that the new device will be ready for quantity application within a two-year period, but some of the more hardy realists will insist that no mobile equipment will be available on the market with fully transistorized receivers in less than three or four years. It is my guess that the transistor will not seriously challenge the dominance of the vacuum tube in most applications until some time in 1958 or '59.

Obviously, there are many applications where the transistor will not contribute anything significant in the way of improved performance characteristics. The first application should come in the areas of our art where the obvious advantages of the transistor will be apparent. As I have stated so many times, the transistor *will not make receivers more sensitive or more selective,* but they can increase the reliability of performance, decrease the power drain, and decrease the size of the unit, with other performance characteristics duplicating vacuum tube results. Reduction in size and power drain are important, particularly to all portable and battery applications. Improvement in reliability is important to all applications, but it is of extraordinary importance to all military electronic equipment. Completely transistorized modules with the life characteristics usually associated with passive networks will be designed for use in complex military electronic weapons systems. With each module hermetically sealed and working with such low voltages and low current consumption, the dielectric strength of components will not be challenged by potential breakdown, and deterioration will not result from internally generated heat and environmental changes of humidity and corrosive atmosphere.

We know that the transistor has an inherent potential life span which implies that it should operate successfully for the life of the equipment. There has not been sufficient emphasis placed upon the improvement in the life characteristics of other components which will result from the use of the transistor in many electronic circuit applications. As I have implied above, two of the most potent enemies of component reliability are high voltage and high temperature. Most of the vacuum tube equipment operates with voltage anywhere from 150 to 250 V., and up. The future mobile and portable receivers will operate with voltages no higher than 17 V. in a 12 V. battery system. High temperatures in equipment are generated by two major sources: Vacuum tube cathode and plate losses. The vacuum tube cathodes are miniature stoves. When ten or fifteen vacuum tubes are crammed in a single case, they heat up the case and all the components inside the container. The transistor works with a few mili-amperes supplied from a 6 or 12 V. source, and the wasteful cathode heating is eliminated entirely. With the transistor, it is possible to use milliwatts, and even microwatts, of power to amplify at low level, while with vacuum tubes we are usually concerned with watts of cathode and plate power consumption while amplifying microwatts or milliwatts of useful signal. Thus, with lower potentials and with the very substantial reduction in self-generated heat, the resistors and condensers used in the set should, for all practical purposes, acquire the extraordinary life span which would be expected of them if they were unused on the shelf or if they were operating in a passive network.

So far, I have discussed the low-level, high frequency transistor. Reasonably high power level audio transistors are also available. Our Motorola Research Laboratories in Phoenix have perfected a power transistor which, in push-pull circuitry directly supplied from a 6 or 12 V. source, will provide a low-distortion audio output of from 3 to 10 Watts. This high-power audio transistor will give you the increased audio power you have been asking for, in applications where the car operation results in the generation of high wind noise levels. The same audio power-transistors, used in oscillator-rectifier circuits, provide high voltage power supplies with most promising characteristics.

As Motorola releases transistorized equipment for the market, you can be sure that a long research, development and field testing program has thoroughly matured the equipment.

Dan Noble

The
MOTOROLA
NEWSGRAM
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MOTOROLA INC.
Communications and Electronics Division
Technical Information Center

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Motorola Communications Expands National Sales Structure

A major expansion of the national sales structure of Motorola Communications and Electronics, Inc.—the establishment of four geographical sales divisions and the appointment of six vice presidents — has been announced by Dan Noble.

In the new alignment, Arthur L. Reese, formerly Assistant Secretary and National Marketing Manager, was appointed Vice President and Operations Manager.

Eugene S. Goebel, formerly National Sales Manager, was appointed Vice President for Market Relations, with duties to include public and customer relations, and other special staff assignments.

Harold A. Jones was promoted from Executive Assistant to the National Sales Manager to the position of National Sales Manager.

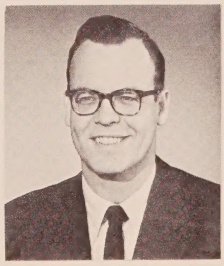
Four former Regional Managers in the field were appointed Vice Presidents and placed in charge of the new sales divisions. They are:

Lowell E. White, Vice President and Eastern Sales Division Manager; Homer L. Marrs, Vice President and Central Sales Division Manager; Edward L. Falls, Jr., Vice President and Southern Sales Division Manager; and Donald F. Brickley, Vice President and Western Sales Division Manager. See page 30 for the new territorial directory.

The reorganization into a divisional sales structure, with officers heading each division, reflects the growth of Motorola's business in two-way radio communications and microwave relay systems, according to Mr. Noble. It is intended to provide more efficient service to Motorola customers throughout the country, and is accompanied by a decentralization of certain of the administrative procedures currently handled at the Chicago general offices.

All appointments are effective immediately.

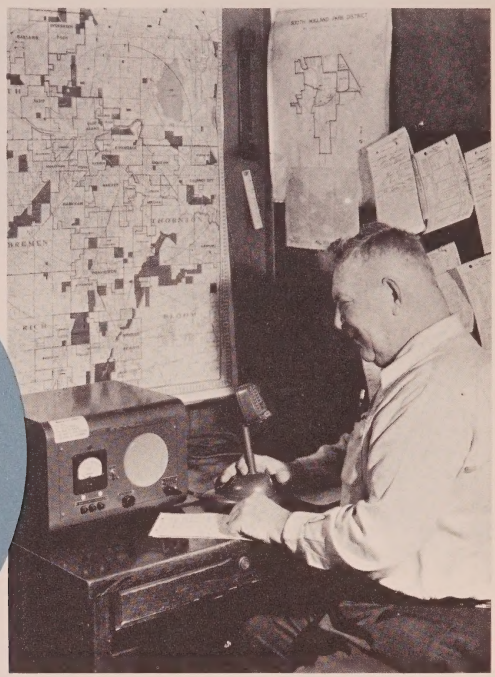
Arthur L. Reese


Harold A. Jones

Eugene S. Goebel

Here's how mobile radio gives Elsinga a

READY-MIX SALES EDGE



Central dispatcher Matt Rogers knows where every truck is and how every job is progressing.

As driver leaves batching plant he gets word to change destinations.

If a mobile mixer breaks down on the road . . . if the address is incorrect . . . if any one of a dozen or more minor obstacles develops, the driver of a ready-mix truck has a problem on his hands.

Sometimes, if he is unable to deliver his load, he is forced to dump it wherever he can before it hardens letting his employer in for a costly chip-out job.

Until the A. Elsinga Cartage Co. installed Motorola 2-way radio in October, 1954, exactly this sort of thing happened all too frequently. Each dumped load represented a loss of between $54 and $72.

Today, all 15 mobile mixers and four other working and supervisory vehicles operated by this Chicago supplier are radio-controlled. Avoiding the cost of "dumped loads" is by no means the only savings.

John M. Vanderbilt, General Manager, attaches great importance to the fact that 2-way radio has given him *complete control* over his trucks. He feels that this control is responsible for the big improvement in Elsinga service and overall efficiency during the past year and a half.

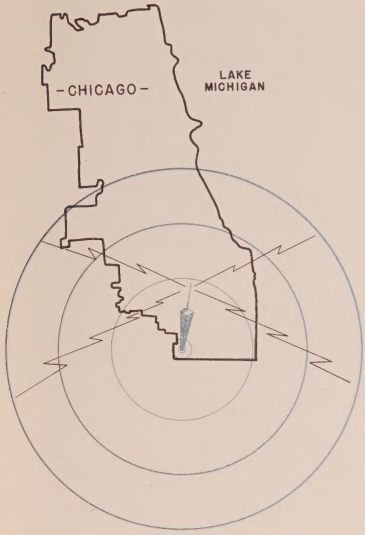
"Our customers can buy ready-mix concrete from several dozen or more other suppliers at exactly the same price we quote," Vanderbilt explains. "All we have to sell is service . . . quick, reliable deliveries . . . and in this 2-way radio is giving us a substantial sales edge. Our customers stay with us because they know they can rely on our delivery promises, and that our trucks will arrive exactly when needed, no matter what happens."

Before Elsinga installed 2-way radio there were many instances of broken delivery promises, although no more than for any other ready-mix supplier who operates without radio.

In a typical instance, the dispatcher would send out a truck-load on an urgent order for, say, six cubic yards, only to have the driver call back on the telephone an hour later to report his truck broken down miles from its destination.

Perhaps the driver had no choice but to leave his truck and walk as much as three-quarters of a mile just to let the dispatcher know about the break-down. If it was below freezing, the load had a one-hour time limit and almost certainly had to be dumped.

By contrast, when a truck breaks down or gets stuck today the driver doesn't even leave his cab. He merely presses his microphone but-



Elsinga's Motorola mobile radio system provides perfect communications throughout 1000-square-mile area.

ton and reports the situation to the dispatcher. In two minutes or less help is on the way to him, and at the same time another truck-load is dispatched to the waiting customer. Almost always it is possible to get the stalled truck back in service soon enough to deliver the load to an alternate destination.

Like many other ready-mix and other truck fleet operators who have installed a Motorola 2-way radio system, Elsinga discovered that *hundreds of hours* of driver time a month are saved because drivers just automatically get more useful work out of their trucks per hour, and when faced with a problem, can contact the dispatcher immediately without wasting many minutes parking their trucks or walking long distances in search of a telephone.

In addition, there is a clear saving of approximately $193 per month on telephone tolls alone, figuring approximately $3 per driver each week.

When this saving is totalled up along with the others mentioned above, it is easy to see why Elsinga's 2-way radio system pays for itself over and over.

"Our Motorola 2-way radios have given us 100% reliability of performance from the first day they were installed," Vanderbilt says. And he points to the following positive benefits:

1. An increase in overall efficiency of at least 50%.

2. A 60% reduction in driver over-time costs.

3. A steadily climbing tonnage volume because customers are learning that radio-equipped mobile mixers can almost always deliver a load on short notice, any time during the working day, under any and all conditions.

4. The almost complete elimination of routine operating errors. The few that do occur can be corrected instantly when either the driver or the dispatcher discovers the miscue. There's never any mix-up over destination or delivery address.

The Elsinga Cartage Co., which hauls concrete on contract for a group of south side Chicago suppliers who have combined their operations under the name of Suburban Ready-Mix Co., makes use of the Citizens Radio Band. The 18 watt RF output base station transmitter and mobile units in the trucks operate on a frequency of 461.7 mc. Communications with all trucks has been faultless throughout the 20 mile radius in which Elsinga operates.

This blanket coverage of a 1000-square-mile service area was achieved through careful systems engineering conducted by Motorola when the installation was made. Particular care was taken in selecting a site for the base station and transmitting antenna, and a location finally was obtained that provides loud, clear signals everywhere the trucks go. This site is on top of a feed mill approximately a mile from the central dispatcher.

The base station is controlled by the central dispatcher at the batching plant, or from two other remote control points at the garage and general offices several miles distant.

Although the majority of radio traffic flows in and out of the central dispatcher's office, the other remote control points add great flexibility to Elsinga's truck fleet communications.

Management can be called directly by foremen for an on-the-spot policy decision, special orders can be given, or the maintenance chief can be contacted directly when a truck needs help. The dispatcher at the maintenance garage also directs the trucks as they leave in the morning and return at the end of the day.

In addition to the 15 mobile mixers, Motorola 2-way radio units are installed in a company supervisory car, a maintenance truck, and in two tractors which are used both for excavating jobs and for assisting mobile mixers that are mired in mud at construction sites.

"Two-way radio has completely changed the complexion of our operations," Vanderbilt says. "Today we are operating far more economically and efficiently than ever would have been possible under our old system, with its slow, make-shift communications procedures." » » »

General Manager John M. Vanderbilt, shown at the remote radio control point in the maintenance shop, answers query from one of the Elsinga drivers.

radios help UNION PACIFIC win customers

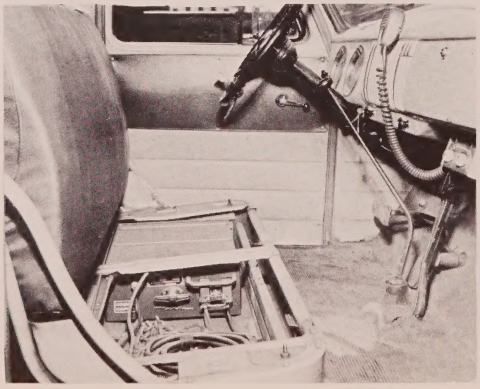
His Motorola truck radio is particularly helpful to Driver W. D. Reily, whose route is in an Omaha residential area with few public phones.

Railroad switches to radio dispatching of its Omaha freight trucks

Good service wins customers—that's a nutshell explanation behind the little antennas sprouting from the roofs of Union Pacific Railroad trucks in Omaha, Neb., and Council Bluffs, Iowa, these days.

Already well acquainted with Motorola 2-way VHF radio in their yard and switching operations, officials of Union Pacific reasoned that mobile radio communication should work equally well in their city pickup and delivery trucks.

Against this backdrop of experience, Union Pacific a few months ago went "on the air" with a Motorola UHF radio network linking the freight terminal and seven trucks serving shippers in the Omaha-Council Bluffs area. Union Pacific thus became one of the nation's first rail-truck carriers to use 2-way radio for freight pickup and delivery dispatching.



Truck radios are tucked away under the seats in most Union Pacific vehicles. Only microphone, control panel and loudspeaker are mounted up front.

The radio complements an aggressive solicitation team working hard to build up Union Pacific's outbound tonnage. Taking full advantage of the news value in their unique set-up, the management distributed hundreds of colorful brochures to present and potential shipper customers, pointing out the improved service now possible through radio dispatching of trucks. As a result of these announcements, UP salesmen are receiving a better audience for their solicitation calls.

The radios operate in the 460 mc Citizens Band to give virtually full coverage of the two-city area. Dispatchers at the downtown freight terminal talk to the truck drivers via the base station located

Dispatcher Melvin Stienblock keeps in close touch with his city drivers by means of this microphone on his desk at the UP freight terminal.

three miles away atop a suburban hotel.

Major advantage of the radio dispatching system has been in improved service to shippers. Particularly between the hours of 3 to 5 p.m., many shippers call the terminal to request freight pickups on priority merchandise. While the shipper holds the telephone, the UP dispatcher radios to the nearest truck and ascertains how soon the driver can make the pickup. Usually the answer is "immediately," and the shipper can rest assured his "must-go" shipment will go.

"Radio is a real boon to our shippers," declares Dispatcher Melvin Stienblock. "They appreciate the personalized service we can give them now."

Not all benefits accrue to the shipper, however. Railroad officials find their trucks get over the routes faster, with no time wasted on telephone check-in calls. Most drivers report they save 45 minutes to an hour daily in telephone time alone.

They save miles, too. It is not unusual for a pickup order to be radioed to the truck driver as he travels near the shipper's location. The stop can be made with practically no additional mileage and very little extra time. Contrast this with the old-style "lost truck" system in which the dispatcher had no means of contacting a truck in transit. In the old days an unscheduled pickup meant a truck had to double back along his path, with resultant waste of time and miles.

Dispatcher Stienblock keeps tight reins on each truck by means of an every-stop-call-in system. Following each truck closely allows him to shift the calls to the less busy vehicles as quitting time approaches. Thus he avoids stack-ups in late afternoon and brings in all trucks earlier.

Union Pacific finds the truck radios are helping customer relations in another way, by eliminating the practice of drivers using the shipper's telephone to call in. Many shippers object to this long-time habit of the drivers because it ties up a company phone. Now the Union Pacific drivers can check in with their dispatcher directly from the radio-equipped truck, saving the time which would otherwise be lost in hunting and using a pay telephone.

Although the railroad owns and services a large number of Motorola radio units in its switching operation, company officials chose to keep the 460 mc truck radio system separate from the train systems. For this reason, maintenance and installation of the truck radios is contracted to Motorola and handled by the Motorola Service Station in Omaha, the Mobile Communications Company.

On the basis of results in the first few months' use, railroad spokesmen report noticeable progress in productivity of the radio equipped trucks. Definitely faster service is being given shippers, and the late afternoon log jam of pickups is a minor problem now. The dispatcher, whose job is closely tied up with the radio, calls it "the greatest improvement in freight handling" he has ever experienced. » » »

Driver Jerry Zach uses hand microphone in City Truck #3 to communicate instantly with the dispatcher or with other Union Pacific freight drivers near-by.

. . . the inside story of

Viscount meal is served by Capital Airlines Hostess Joanne Varrata.

AIRLINER FLIGHT MEALS

With 2-Way Radio Controlling its Trucks Hot Shoppes Caterers Now Loads Food on More Airliners Than Ever . . . With Time to Spare

Airline catering is an emergency business by nature . . . a series of crises. That's from a man who ought to know: Errol W. Roberts, District Supervisor of Hot Shoppes Caterers, Inc., at Chicago's Midway Airport.

The airline passenger, riding comfortably above the clouds as he savours a hot, tasty flight meal, is not aware of this fact, of course. Nor of the 'round-the-clock beehive of activity on the ground that makes his sumptuous, even luxurious, airborne repast an important part of the expanding air passenger industry today.

This intense ground activity, particularly the split-second loading of flight meals on the planes, got a little too hectic for comfort about three and a half years ago, however. Then, as now, expanding air travel almost daily was increasing the number of meals Hot Shoppes Caterers had to produce and deliver—on time.

Because of heavy airport auto traffic congestion and other obstacles such as truck breakdowns, and bad weather, which upset airline schedules across the board, an increasing number of catering trucks reached the flight ramps behind schedule, even causing the delay of take-offs while food was loaded into the planes. Since Hot Shoppes' kitchens are a mile from the airport, these obstacles had always existed, of course. But with expanding business and correspondingly tighter truck schedules the delay enroute that once was of no concern had become a serious threat to reliable performance.

An immediate study of the problem was made, which showed that the fact that enroute trucks were "lost" to the dispatcher—out of communications—made it impossible for him to take remedial action to overcome these transportation difficulties. This had been the company's experience at Newark Airport where, earlier, delivery trucks had been equipped with 2-way radio to plug the communications gap and assure on-time delivery.

Hot Shoppes Caterers in Chicago wasted no time following suit. Four trucks were equipped with mobile radio, and a base station was installed by the dispatcher at the kitchens, following issuance by the FCC of a Low Power Industrial license. An immediate, almost sensational, improvement in the truck delivery operations was noted.

True, the obstacles . . . the traffic, the freight train waits . . . were still there. But with mobile radio *control* the dispatcher could reroute trucks to get around them, or quickly dispatch help when mechanical breakdowns occurred. Hot Shoppes began loading its 90 airplanes a day with time to spare

. . . no rush, no more close calls.

To understand why mobile radio today is so indispensible, it is necessary to appreciate that airliner meals cannot be prepared until almost the last minute. That puts the burden of guaranteeing on-time delivery on a fleet of trucks that operate, necessarily, on a very close margin.

Flight meal preparation is a last-minute proposition because airlines themselves do not know until an hour or so before a flight exactly how many passengers must be served. Also, food prepared too early tends to lose its inviting flavor.

Everything is packaged, ready for the stewardess to serve. A typical plane requires approximately 50 meals. These involve the handling of some 2,500 separate items, such as utensils, trays, creamers, coffee, tea, cold and hot water, napkins, etc.

All of this, transported in bulk containers, must be loaded, trucked, and unloaded manually into compartments in the plane.

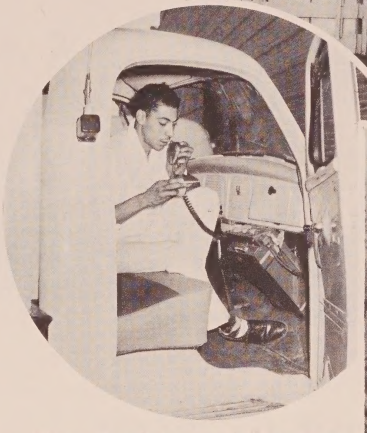
After the food is loaded into the plane, the invoice is signed by the stewardess or cabin attendant. If some discrepancy occurs between the actual load count and the invoice, a quick radio call usually clears up the difficulty.

Hot Shoppes serves the airliners of three domestic and three international airlines: Pan-American World Airways, British Overseas Airways Corporation and Air France are the overseas group, and Eastern Airlines, Capital Airlines and Northwest Orient Airlines operate in the United States.

Food requirements for the six airlines vary from one end of the culinary scale to the other . . . from quick "snacks" of cookies and coffee to a cuisine to delight the most sophisticated traveler. But whatever the airline . . . whatever the flight schedule . . . Hot Shoppes' trucks always deliver the food on time. A fair share of the credit for this reliable performance goes to Motorola 2-way radio.

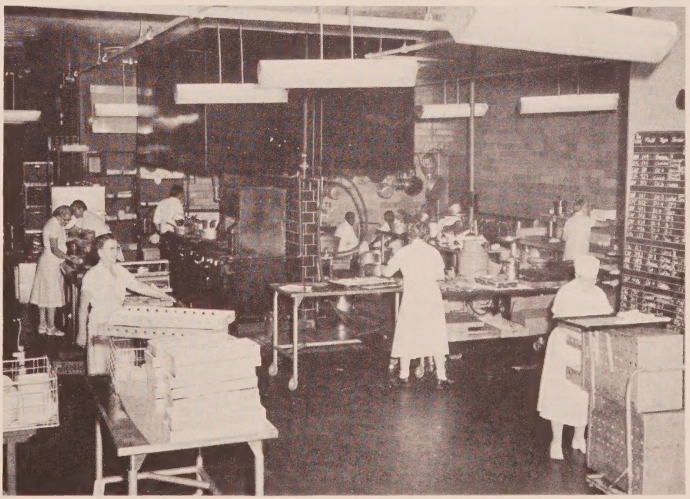
"All in all, we estimate that Motorola mobile radio has boosted our efficiency by at least 35%", Roberts says. "Needless to say, it long ago paid for itself."» » »

When food is loaded into an airliner, small-item shortages can be filled from a ramp supply truck called by 2-way radio.

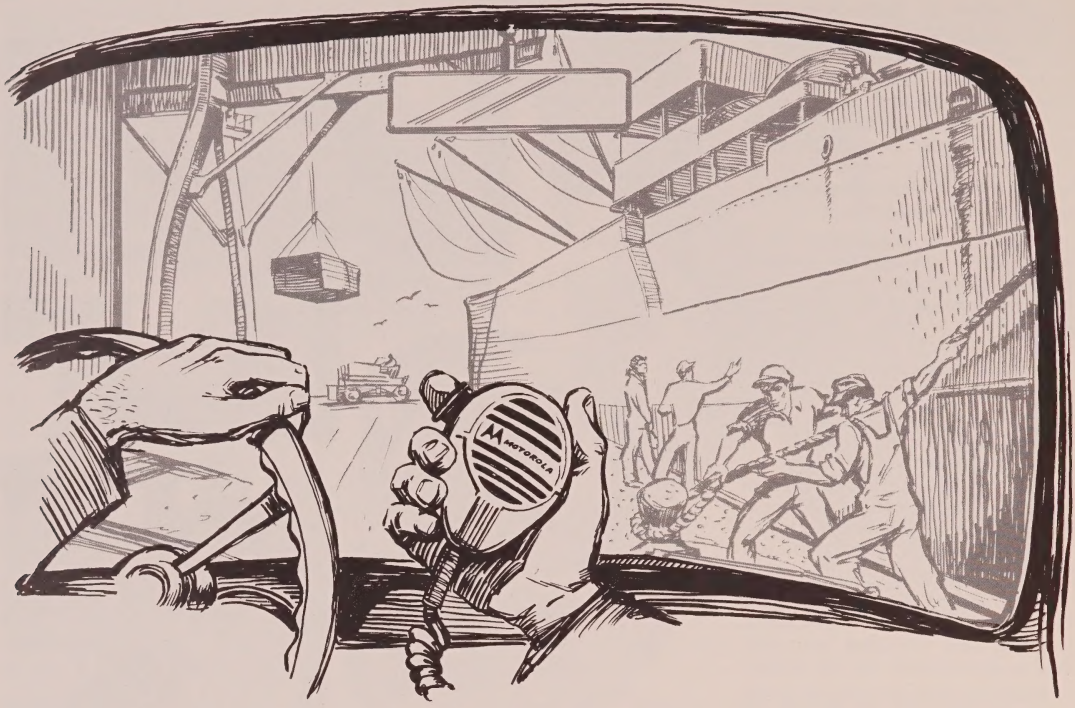


Above, The "ramp truck" fills shortages and supervises loading and stripping of planes during rush periods.

Right, Radio dispatcher Lillian Schuda keeps trucks on schedule . . . knows instantly when they need help.



A portion of Hot Shoppes kitchen at Chicago. Note giant flight schedule board at right which sets pace for kitchen activity . . . and trucks as well.



RADIO EQUIPPED LINE HANDLERS

Speed Ship Arrivals, Departures

What pier is the *Minnesota* docked at? What time will the *Havfalk* arrive? Is the *American Scout* going to have any trouble getting into Pier 3 past those barges? How can I get in touch with Mr. Walker down on the *African Enterprise?* Is the *Robert Maersk* going to be in port tomorrow?

In Baltimore the answer to any question around the waterfront is always the same:

Ask Mike!

Mike is Mike Cataneo who runs the port's line handling business and is credited with having information on almost every vessel that enters the port. In addition to this, by using radio-equipped cars—and he was the first one in the nation in this business to install them—he has demonstrated to steamship companies that they can get information to their crew members or to working personnel aboard the ship down at the faraway pier in only a matter of minutes.

Just the other day, somebody wanted to talk to a United States Lines official and called Mike's office requesting that he ask his men to have the executive call him. It seemed as if he had no sooner hung up, when the phone rang and on the other end was the captain.

Steamship companies and agencies like Mike, not only because he gives such service, but also because they know that when a ship is coming in for a certain type loading, each of the hatches will be located in the proper position on the pier so the ship will not have to be shifted later.

For instance, he knows that the hatches of the *S.S. Elba* are closer together than those on the *Ferngulf* and in order to have two grain spouts working simultaneously at the Port Covington Grain Elevator, she has to be in position at the two most forward grain bins.

He also knows how heavy the lines are on every ship which has ever been in the Port of Baltimore and knows whether to send out two or four men.

On ninety per cent of the jobs in the port, only two linemen are need-

ed. Linemen cruise around in new radio-equipped station wagons and are strategically located, so that they can be dispatched quickly to any ship no matter what its location.

The Cataneo Line Company started out in 1927, when Mike's father, the late Peitro, better known as "Tony," was standing at a pier gazing out from his tiny lunch wagon. A British captain yelled to him "Grab that line."

Tony did, made it fast and signalled he was ready for the other line. After the ship was moored the skipper paid him three dollars and told him he would get two more dollars if he let the line go when ready to sail. The immigrant Italian said to himself, "How long has this been going on? This sounds good."

So with the help of one or two friends he was on hand, thereafter, to greet incoming ships and to let their lines go when they were ready to sail.

As business increased, his two young sons, John and Mike, came down to help. In those days it was not uncommon to see all three male members of the family trudging down to the piers through three or four feet of snow at 4 o'clock in the morning in order not to miss a ship and also so they could prepare coffee and other food for the workers. As the line tying business improved the lunch wagon was dispensed with and the Tony Cataneo Line Company was formally found.

Roving linemen in radio-equipped station wagons provide quick service for vessels in both public and private piers.

For many years they covered only part of the public section of the port. But gradually, they managed to assume the handling of vessels at all of the public and some private piers.

The Cataneo Line actually established the tying and untying of ships as a regular business. Their fame has spread to other ports, and others copied. Even so, no one will ever have quite the know-how that Mike does. He still shows up on the job at 5:30 a.m. daily so that he's there when most ships are arriving or shifting. He's able to handle everything with a minimum staff of 24 men. He has 30 regular employees and a few part-time employees who help during rush hours or when someone is sick.

Recently he converted one of Baltimore's famous row houses into a modern office in the heart of Baltimore's heavy industrial section. Mike has a Motorola base station unit in the office where he and his two assistants work.

There is one special service he supplies that again is absolutely free of charge: the handling of barges or lighters which are moored in the spaces in which a ship is to be docked.

He proceeds to have his men clear the slips without consulting anybody so that a ship will not have to be delayed in her docking, and longshoremen gangs will not be delayed in their work. This is particularly appreciated by the steamship agencies who dislike being awakened at 6 a.m. and then would have to call a number of persons before they could get the small craft out of the way.

Obviously one of the principal reasons of Cataneo's success is the fact that he's seriously interested in looking out for the general welfare of the Port of Baltimore, and whenever he can help a company cut costs by getting ships into position without delay he does, as well as advising agents when he knows that they are unaware of a certain condition in a berth. He's smart enough to realize that what helps the Port of Baltimore, helps everyone, including himself. All owners and shippers are looking for ports with the lowest operating costs.

Mike Cataneo receives a request from a steamship agency for linemen. With him are his dispatchers, Joe Jaskulski and Bill Gentile.

Daniel E. Noble, (right) Motorola vice-president, examines a map showing major Motorola 2-way radio systems installed in Mexico. With him are Hector Cadena and Sydney LaNier, officials of Electro-Labs, S.A.

Expands Facilities

The tour of Electro-Labs' new building included a visit through extensive stockroom and servicing facilities.

New headquarters for Electro-Labs, S.A. is this six-story building.

Electro-Labs, S.A., agents in Mexico for the Westrex Corp., Motorola's export distributor, recently inaugurated new 2-way radio sales and service facilities in Mexico City.

The ultra-modern, multi-story building includes complete communications servicing facilities, expanded office areas, and large product display and storage areas. These new facilities will enable Electro-Labs to provide better service to the numerous Motorola 2-way radio users throughout Mexico, which include the Federal Highway Police, the Society for the Prevention of Hoof and Mouth Disease, and some 50 other radio communications systems.

Typifying the increased use of 2-way radio is the Federal Highway Police which, with its present radio system covering three zones —Mexico City, Monterey and Linares—is in the midst of a planned expansion program that will establish during this year radio systems for the Veracruz and the Bahio zones. Careful studies are made to obtain maximum coverage from the area base stations. Thus, the Mexico City coverage is about 20,000 square miles, obtained by a 250-watt base station located at a point 13,500 feet above sea level and remotely controlled from Mexico City by 450 mc. radio relay equipment.

At inauguration ceremonies Sydney R. LaNier, manager of Electro-Labs, was host to Daniel E. Noble, vice-president in charge of Motorola's Communications & Electronics Division, and other prominent industry and government officials from the United States and Mexico.

Mr. Noble discussed Motorola's plans and the future of the electronics industry. He pointed out that the transistor will significantly influence, over the next few years, the field of communications, including radio and television, because of its simplicity and numerous applications.

During his week-long stay in Mexico, Mr. Noble met with Walter Buchanan, now Acting Secretary of Communications, and visited the National Polytechnic Institute and the National University.

Mexico's Highway Police Force, some of whom are shown here assembled after a parade, presently have 40 mobile radio units and are in the midst of a planned expansion program to provide country-wide radio coverage.

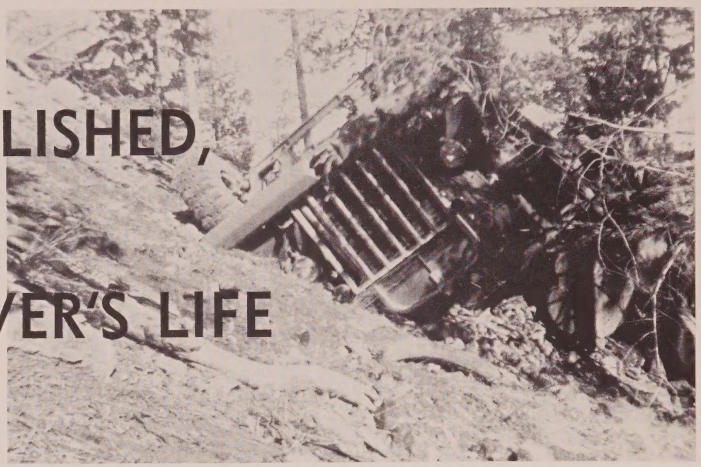
With this Motorola base station unit, the Banco del Pequeno Comercio maintains contact with a number of mobile banks.

in MEXICO

Above Inside view of one of the mobile banking vans which circulate through Mexico City.

Bank tellers and guard pose in front of one of the radio-equipped mobile banks which are familiar sights to depositors in Mexico City. This mobile banking service follows a definite schedule for the convenience of customers.

TRUCK DEMOLISHED, RADIO SAVES INJURED DRIVER'S LIFE



B.C.K. Truck 55, loaded with 12,000 feet of pine, plunged over 100 feet down the Oregon canyon side before stopping against the trees.

PRINEVILLE, Ore.—"If anybody can hear me, come down here quick—I've tipped my truck over . . ."

These cryptic words heard on a truck radio may have saved the life of an Oregon logger, Jack Fischer, who was badly injured when his heavily loaded truck plunged down a 105 foot bluff recently.

Fischer, driver for the B.C.K. Company Inc. of Prineville, Ore., was knocked unconscious in the accident. He lay helpless 30 minutes before sounding his plea for aid.

His message was heard in another B.C.K. truck a mile away and a search was started immediately. After locating the mishap, the crew of the second truck used their mobile radio transmitter to summon medical assistance and an ambulance. They also used the radio to help clear the logging road so that the ambulance could remove the injured man at top speed.

Mr. Robert L. Kincaid, president of B.C.K., credits the Motorola radio in large part for saving Fischer's life. "Without his message, we might not have missed Jack for several hours, and in the darkness, he could have laid undiscovered for many hours," explains Kincaid.

The fact that Fischer was heard seems almost miraculous. His truck loaded with 12,000 feet of pine fell 60 feet before hitting the slope of shale rock, and then rolled another 55 feet before coming to rest bottom side up. The cab was completely demolished, and the radio antenna atop the cab was either broken off or buried in the ground beneath the wreckage. Despite this, Fischer's message got through to the other crew a mile away.

The accident occurred 42 miles northwest of Prineville at dusk on the evening of October 14, 1955. Fischer was making his final trip of the week to the Alexander-Stewart mill in Prineville when a coupling pole snapped, pulling the truck and trailer over the bank.

Kincaid said it could not be determined whether the driver was thrown from the truck or rode it down. When rescuers reached him, Fischer still lay semi-conscious beside the wreckage. The radio microphone dangled by its cord through what had been the door to the cab. Fischer, who suffered broken ribs and a head injury, says he cannot remember radioing for help. The rescuing crew heard his voice clearly over their truck radio, however.

B.C.K. installed their 2-way radio system in March, 1948, and it has been in daily use since that time. Their Motorola equipment is licensed by the Federal Communications Commission to operate in the 153 megacycle Forest Products Radio Service.

"The radios have served us in countless ways since we installed them nearly eight years ago. This accident proves again that the equipment can take a lot of punishment and still come through when needed." » » »

A mammoth Logging truck like this took the 100 foot plunge. The badly injured driver managed to use the truck's Motorola radio transmitter to call for help.

Base radio station of Los Angeles Airways, Inc. Selector box for the Motorola QUIK-CALL selective calling system is at the right of the operator.

Motorola "Quik-Call" Selective Calling

Assures Interference-Free Communications for

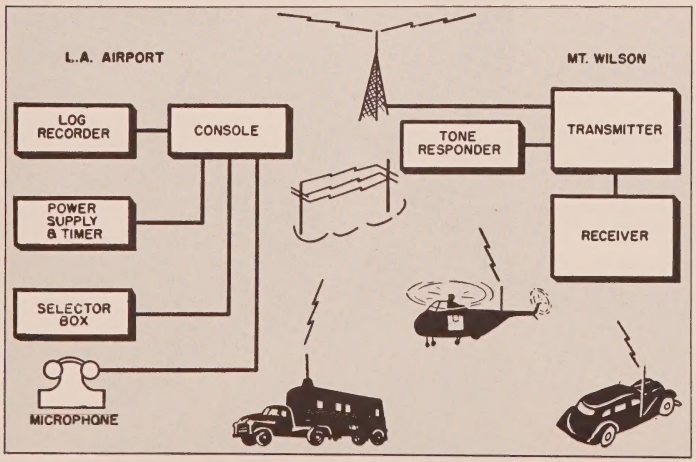
Los Angeles Helicopter Service

The Los Angeles Airways operates a bustling ground vehicle and helicopter airmail, air express and passenger service throughout the greater metropolitan area of this giant west coast city.

More than 72 stops are made throughout a 50-mile radius, to handle half a million pounds of airmail, 100,000 pounds of air express, and passengers—all closely coordinated with the schedules of 275 daily airline flights.

A modern 2-way radio communications system, the heart of which is Motorola "Quik-Call" Selective Calling, is one of the big reasons why LAA's central dispatcher at the airport can so perfectly control the movements of more than 17 trucks, automobiles, trains, and helicopters.

The LAA communications system, under Richard A. Girvin, Superintendent of Communications, operates under the new FCC "Aeronautical Metropolitan Area" ruling 9.1103. It consists of a remotely-controlled transmitter of Mt. Wilson, the dispatcher's control station at the airport, and the ground vehicles and aircraft.



Functional Block Diagram of the Radio System used by Los Angeles Airways, Inc.

Since a "party-line" system like this could be saturated quickly without a "net control" for traffic, and, also, because stations in one of the three valleys formed by the mountains could unknowingly interfere with stations in the other valleys (whose VHF signals they could not hear), some means of efficient channel utilization was imperative. The solution was Motorola "Quik-Call", which permits only the dispatcher to activate the mobile stations . . . individually or in groups. This also means that operators are not saturated with traffic. The operator, hearing his receiver turn on, knows the message is for him.

The dispatcher can issue "group calls" to seven individual stations at a time, for transmitting blanket messages of concern to only one segment of the system, or for locating a station whose identification was missed.

The Motorola "Quik-Call" equipment also turns the Mt. Wilson transmitter signal on and off by a tone signal carried over the same 25-mile leased line system that conveys the dispatcher's voice to the transmitter. This line also carries back the incoming messages picked up at Mt. Wilson. »

After spotting a farm account on map of Jackson County, Okla., Ersa Kiker is ready to dispatch orders over Motorola base station transmitter to one of three trucks serving the area.

If you'll publicize its benefits to your customers,
you'll find that Two-Way Radio is an . . .

. . . EFFECTIVE SELLING TOOL

Frequently companies buy equipment or change operating procedures in order to improve the service they provide to customers. To keep these changes or additions a secret is to neglect the opportunity of telling customers a very interesting story . . . a story that will not only impress them with your desire to serve, but one that will give them another reason to take advantage of your services.

An example of newsworthy equipment additions is the installation of two-way radio in trucks. Two-way radio is no longer uncommon in the LP-Gas industry and many companies have come to consider it essential to efficient, economical operation. However, while many benefits accrue to the company that installs it, the customer also benefits. It is the wise, progressive company that lets its customers know.

Kiker Butane driver adjusts squelch control on the Motorola control head before he starts off in the morning to make deliveries. Drivers like radio because it has eliminated much after-hours work for them.

One such company is the Kiker Butane Co., Altus, Okla., owned by Ersa Kiker. After he installed two-way radio in his butane delivery trucks, he announced the addition with a full-page advertisement.

In part, his copy read:

"As an added feature to our customers, we have just installed the very latest type Motorola two-way radio dispatched service for our Altus office and all three trucks serving this area.

"Now with this added equipment we can make contact in seconds with our truck drivers in this area. When our drivers are in a certain area making deliveries, it will not be necessary for them to return to the Altus office to pick up new delivery orders. As your order is phoned into our office, we will radio the truck nearest you giving your name, location and the amount of gas needed. If the truck happens to be near your place, it will be only a matter of minutes before he reaches your home!

"A recent example of how fast this new service really can be was related by one of our drivers.

"At 11:15 A.M. Friday, Truck No. 2 driven by Glen Ford was at the M. H. McLeod place eight miles north of Altus and one mile east filling a tank there. The driver was called by radio and sent to the Grover Paine place, four miles north of Altus. He was at the Paine place at 11:29 A.M. ready to fill the tank. The Paines could hardly believe it! Since it took Mrs. Paine two minutes to call our office, the total elapsed time was only 17 minutes! We feel that this is really a special service for our customers and naturally we are proud to serve them in such an efficient manner."

Kiker Butane serves a 3-county area within a 35-mile radius of Altus. It has over 800 customers, many of whom are large volume users of LP-Gas as a fuel for their tractors as well as for domestic needs. About 30 per cent of the company's annual load now goes for motor fuel purposes.

Headquarters at Altus include bulk storage facilities for 25,000 gal. A substation is located 20 miles southwest at Eldorado, Okla.

One of three trucks which, as a result of two-way radio, have been able to reduce delivery mileage by almost 200 miles each month, Kiker Butane Co. reports.

Mr. Kiker has found that radio is an important factor in keeping his driver's morale high. Before radio was installed, last-minute calls made it necessary for them to go out and make deliveries after quitting time. Now with radio, calls can be handled by trucks on the way back to the plant and after-hours work has been eliminated. He also estimated that two-way radio saves his 3 trucks an average of 200 miles per month.

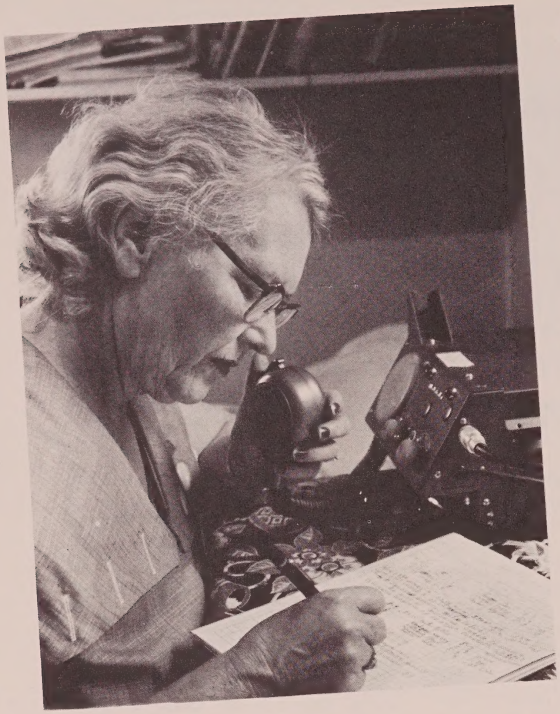
Tractor fuel business is growing fast, and being an "off-season" load it keeps his men and trucks busy during the non-heating months. Radio has become an increasingly important factor in serving these summer customers.

Mr. Kiker declared, "In the winter heating season we can be fairly sure that our customers are using a certain amount of fuel for heating. This enables us to schedule deliveries on a normal consumption basis. But in the summer there is no way of figuring when a farmer will run out of fuel . . . one will be plowing when his neighbor isn't. Radio does a job for us in serving these unpredictable users that we could hardly accomplish any other way."

He also uses two-way radio to direct activities at the Eldorado substation. When a driver pulls up to that remote tank, he gets his refill instructions from the radio in his trucks. He is told whether to refill with butane or propane, how much to load, and the names of customers waiting for service. Sometimes, radio is the only contact Mr. Kiker has with the driver working the Eldorado route for a week at a time.

The company operates its radio system on a frequency of 35.78 mc., and has 3 Motorola mobile units and a local control 60-watt base station unit. The non-directional ground-plane antenna is mounted on top of a 97-ft. tower beside Mr. Kiker's Altus office. »

Headquarters of the Kiker Butane Company, Altus, Oklahoma, which serves over 800 customers within a 35-mile radius.



The Motorola two-way radio unit is used at the auxiliary Civil Defense headquarters in Delafield during a Civil Defense drill. (Milwaukee Journal Photo)

communications for

CIVIL DEFENSE

It is essential to any community that its Civil Defense communications system be designed to serve it speedily, in any eventuality. Sound basic planning is of greatest importance. In view of the threat of thermo-nuclear weapons and the problems of "fall-out" the importance of a thoroughly efficient two-way radio communications system cannot be overrated. Far sighted cities and towns across the country, realizing this importance, have already made great strides toward insuring that their's will be a prepared community if and when disaster strikes. Below are a few examples of Civil Defense communications activities.

MILWAUKEE, WISCONSIN

Milwaukee has, in past Civil Defense drills, set up an auxiliary headquarters at St. John's Military Academy at Delafield. Delafield was selected because Civil Defense officials felt that it would be outside the destructive range of even the largest hydrogen bomb likely to hit the city. Constant contact was maintained by this post, with the main Civil Defense headquarters using a radio link.

SALT LAKE CITY, UTAH

Salt Lake City's Civil Defense mobile control unit is a well-equipped station wagon used as an auxiliary control center and for conducting drills and training personnel. To meet the power requirements of the large number of radio units in the car, a special alternator-rectifier system was installed which provides ample DC power, as well as 250 watts of AC power at 110 volts.

Communications equipment includes a two-channel FM two-way radio unit operating on the city police and fire frequencies; a two-way AM unit operating on the disaster service channel of 1761.5 kc.; a standard broadcast receiver for monitoring Conelrad; portable radiophones on the police and fire departments' frequencies; and a portable three-channel transmitter-receiver for the disaster service, which can be used with AC power when the car is not in motion. A monitor receiver on the state police frequency permits cross-band contact with them. A shortwave receiver receives amateurs on the RACES frequencies. There is even a two-way unit on the Civil Air Patrol frequency. Equipment can be operated from the front seat or from the back of the station wagon when the rear door is folded down to serve as a table. The station wagon carries first-aid equipment and also spare antennas which can be strung to trees or nearby buildings. Effectiveness of this mobile communications equipment as a control center and training aid has been proven beyond a doubt.

Salt Lake City's Civil Defense mobile radio unit has a public address system operating through one of the radios, and utilizing the two loudspeakers mounted on the front fenders.

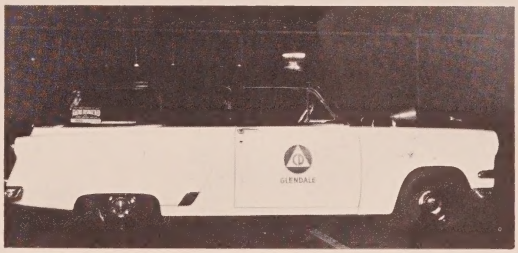
R. I. Morris, assistant director for Civil Defense of Orange County, Demonstrates Motorola a HANDIE-TALKIE portable radiophone that is also included as communications equipment in the trailer.

ORANGE COUNTY, CALIFORNIA

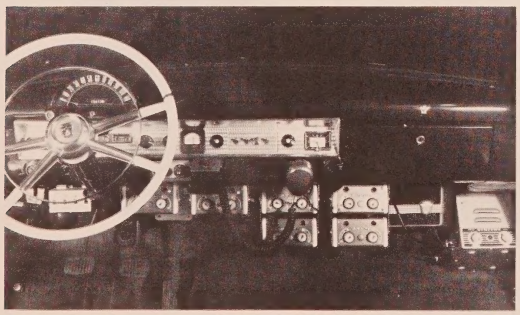
A newly developed RADEF trailer to be used by 30 radiation detection squads boasts two kinds of radiation counters and a two-way radio for communications with area Civil Defense headquarters at Mount Lee, Hollywood.

GLENDALE, CALIFORNIA

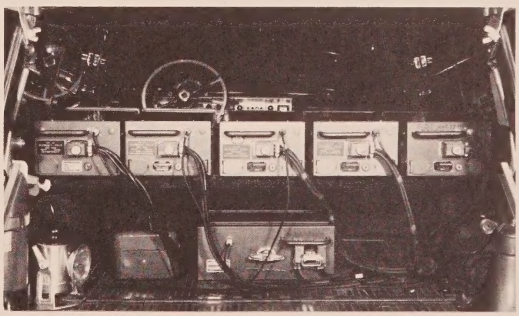
Under the direction of Carroll M. White, a model two-way communications system has been carefully developed. The Glendale system now comprises 11 base stations and more than 200 mobile units. With reliable performance their chief concern, Mr. White and his colleagues chose Motorola two-way radio for all phases of the communications system. One of their mobile units, dubbed the "Glendale Rocket," is illustrated in the accompanying photographs. One cannot help but be impressed with the highly efficient manner in which the equipment has been installed—utilizing a minimum of space without crowding. » » »



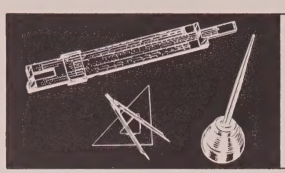
Four of the 5 antennas on the "Glendale Rocket" appear in this picture. A 6 meter whip antenna, not showing, is mounted at the left rear of the vehicle.



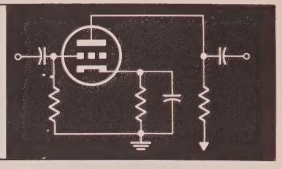
Six control heads mounted on the dashboard are for 154.43 mc., Los Angeles County Fire frequency; 159.09 mc., Glendale Police Department; 153.89 mc., Glendale Fire Department; 160.77 mc., State Radiological Service; 47.98 mc., Glendale Public Service; and 453.75 mc., Highway Maintenance, also administrative and civil defense command functions.



Glendale's chief radio technician, Ed Scott, improvised a cleverly designed selector switch which allows one microphone to serve all channels. All of the radio units in the top row are in the 150-170 mc. band except the unit at top left, which is 47.98 mc. Unit on the floor houses the 453.75 mc. transmitter and receiver.



Technical Notes Section



MOTOROLA MICROWAVE . . . . .

. . . designed for dependability

Motorola's engineering staff has always placed special emphasis on dependability. In selecting the frequency band and in designing the RF system, the primary objective has been to produce microwave equipment that is completely dependable.

One of the most important decisions in the development of Motorola microwave equipment was the choice of the 6000-7000 megacycle band. After a long, careful study of all factors, both from the theoretical viewpoint and experimental information, this frequency range was selected from the several available as the one which would provide the best overall operation.

One of the immediate benefits of this selection was the extremely high antenna gain that could be realized from a reasonably sized paraboloid antenna (most Motorola antennas are only 40 inches in diameter). Another distinct advantage of the 6000-7000 megacycle band is that it permits the use of a small, practical passive reflector. Installation and maintenance of the equipment is simplified because all equipment and the paraboloid antenna can be located at the ground level. Power is radiated upward to the 45° passive reflector mounted on the tower, and the beam is directed horizontally to the distant station. Thus, there are no long exposed runs of waveguide or coaxial cable to maintain.

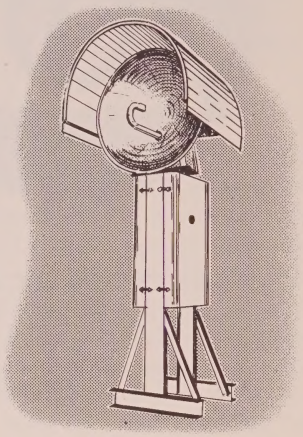
There are other advantages too. This frequency makes it possible to design very efficient waveguide filters and to use a waveguide with a high cut-off frequency, making the equipment impervious to all kinds of disturbances and transmissions at lower frequencies.

Finally, the use of this frequency permits a wider modulation band with more voice channels. Or, by exchanging the bandwidth for better signal-to-noise ratio on fewer voice channels, very flexible and simple frequency-modulated multiplexing equipment can be used.

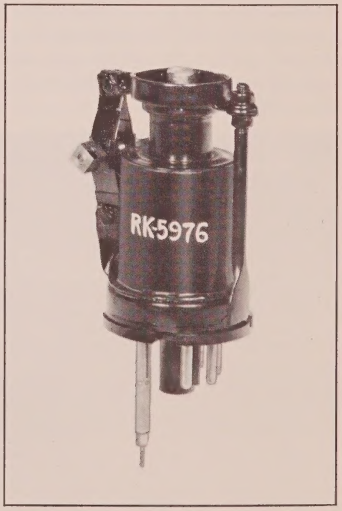
Reflex Klystron Tubes

One of the reasons for the reliability of this microwave is the use of a reflex klystron as a method of generating RF power for continuous transmission. Field reports from many installations indicate that this tube can be used for many years without replacement. Because of this long, dependable operation, the replacement cost of klystrons is remarkably low.

Klystrons save money in other ways, too. All klystrons can be kept in operation for approximately their full service life; a warning of the life end of the tube can be obtained several hundred hours in advance by observing the klystron beam current. With this clear advance warning, the tube can be replaced at the right time to avoid an unscheduled interruption in service.



A major advantage of the klystron tube used in this equipment is that it lends itself readily to frequency modulation. The complex modulating voltage is fed through a simple modulating amplifier and applied directly to the



The reflex klystron, heart of the transmitter section, lends itself readily to frequency modulation.

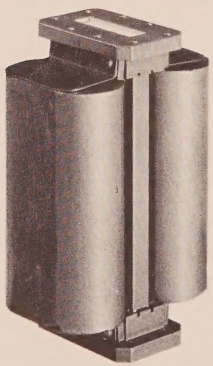
repeller of the klystron tube, thus producing a frequency-modulated signal.

Reports from the field also prove that the klystron provides excellent frequency stability of better than ±.05% in normal operating conditions. To guard against frequency shifts that might be caused by radical external temperature changes, a special thermostatically controlled heated chamber encloses the klystron tubes and the RF waveguide assembly. The temperature in this chamber is kept at 130° F, regardless of the outside temperature.

Ferrite Isolators

One of the recent design features incorporated in Motorola microwave equipment is the ferrite isolator. The ferrite isolators currently used are of the resonant absorption type and provide a reverse attenuation in excess of 40 db, with less than 1 db loss in the forward direction. Simply, this unit is a unilateral transmission device which is used to isolate the transmitter klystron from the rest of the waveguide assembly.

By minimizing the effects of any mismatch or long-life effect

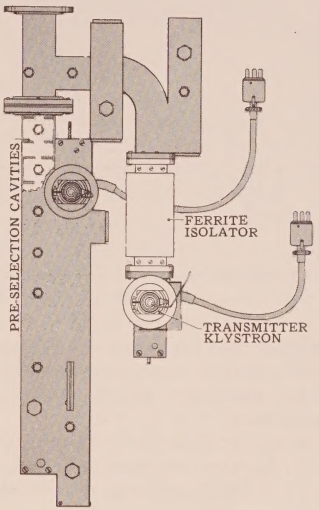


Absorption type ferrite isolator provides high reverse attenuation and makes longer waveguides practical.

presented to the klystron, the ferrite isolator virtually eliminates frequency pulling, gain variation and distortion of the modulation characteristic. Thus, longer waveguides are practical, permitting more freedom in the construction of the buildings to house the microwave equipment and the placement of the antennas.

RF Waveguide Assembly

The Motorola waveguide assembly consists of two basic sections, one for transmitting and one for receiving. Both are duplexed to operate in conjunction with one paraboloid antenna. The transmitter section is designed to provide optimum values of power output and modulation sensitivity with minimum distortion.



Typical waveguide assembly showing pre-selection cavities, ferrite isolator, and transmitter klystron.

In the receiver section very efficient bandpass filters are built into the waveguide by splitting it into separate cavities. This series of pre-selection cavities, "tuned" to provide a bandwidth of approximately 20 megacycles, pass only the desired signals to the mixer crystal. The cavity filter offers a very strong rejection to signals outside of the pass bandwidth.

Another advantage of the waveguide assembly employed in Motorola equipment is that it provides an inherent low-frequency cut-off point of approximately 4300 megacycles. Any radiation below this frequency, no matter how strong, is attenuated inside the waveguide assembly. This attenuation permits microwave stations to be placed side-by-side with any high-power VHF or low-frequency transmitter. The radio signals do not desensitize or adversely affect the operation of the microwave system in any way.

Antennas and Reflectors

Motorola microwave antennas permit an unusual degree of flexibility and efficiency. The 40-inch paraboloid antenna provides a gain of 35 db at 6700 megacycles. The beam width between 3 db points is 3.5 degrees. The tower mounted reflectors are designed to intercept the beam and to provide essentially loss-free transmission to the next station. In fact, as a result of the curvature of the passive reflectors and the aperture effect, considerable power gain is usually realized.

Summary

Operation in the 6000-7000 megacycle band offers many advantages contributing to the dependability of Motorola microwave equipment. A high antenna gain can be realized from antennas of moderate proportions. Passive reflectors of a practical size can be tower-mounted to provide loss-free transmission to a distant station. Installation and maintenance is simplified because all equipment is located at the ground level. Operating on this frequency also makes it possible to design efficient waveguide filters and to use a waveguide with a high cut-off frequency. Operating bands are wider, with improved signal-to-noise ratio and easier transmission of complex forms of intelligence.

Klystron tubes and ferrite isolators also add to the reliability of Motorola microwave equipment. Klystrons lend themselves readily to frequency modulation, have a long life, and provide excellent frequency stability. Ferrite isolators minimize the effects of mismatch and long-line effects, virtually eliminating frequency pulling, gain variation and distortion of the modulation characteristic.

SERVICE HINTS and SHOP NOTES

BENCH TEST POWER SUPPLY

The problem of obtaining an adequate power supply for servicing 6- or 12-volt communications equipment can be solved with the use of filtered DC power supplies. One type of a DC power supply that has been found suitable for this purpose is the Electro Model "B" (See Fig. 1). The Model "B" was designed primarily for the operation and testing of automobile radios. However, several of these compact power supplies can be used in parallel to provide the necessary amperage without overload. The Model "B" provides an adjustable source of 6 volts DC for all current loads from one to twenty amperes continuous output. It will operate with intermittent loads up to thirty-five amperes. Two of these power supplies in parallel are required for testing any 30 watt transmitter and four in parallel will supply sufficient amperage for testing of 60 watt units. Fig. 2 illustrates four such power supplies with a switching arrangement making it possible to have outputs of:

6 volts at 80 amperes, continuous
12 volts at 40 amperes, continuous
24 volts at 20 amperes, continuous

Because of the transmit-receive load variations, it was found necessary to provide means of controlling the AC input voltage so as to be able to govern the output voltage in accordance with the transmit-receive load requirements. This was successfully accomplished by using powerstat controls in the AC input circuit (Fig. 3). In operation, the powerstat T2 is adjusted for proper voltage output on "Stand-by." Then when the transmitter is keyed, the 6-volt control relay puts powerstat T1 in the circuit

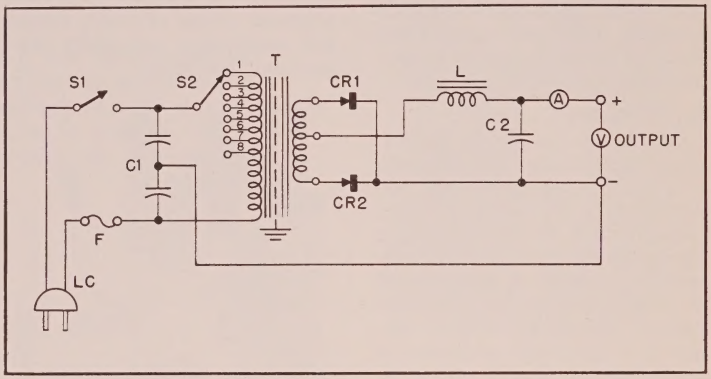


Fig. 1. Model B Schematic Drawing

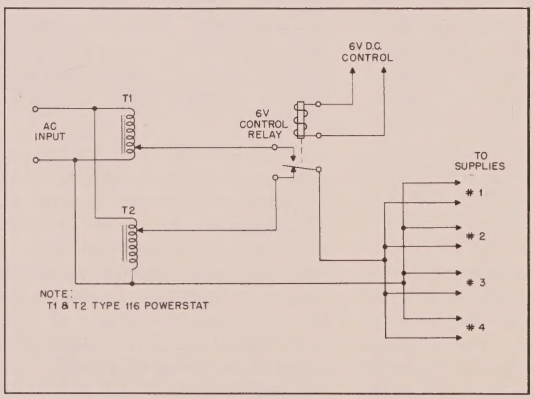


Fig. 2. Output Circuit D.C. Power Supplies

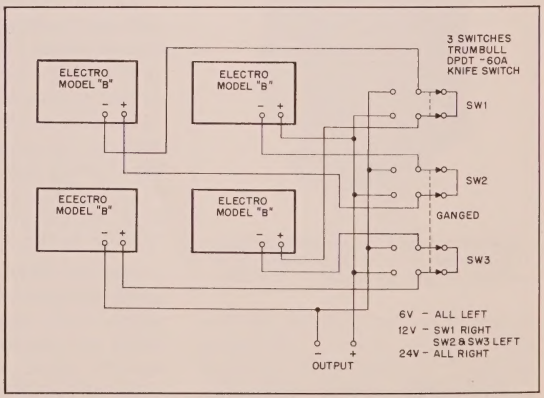


Fig. 3. AC Control Circuit for D.C. Power Supplies

which has been set for the proper transmit load voltage. The 6-volt DC control voltage can be picked up at the radio units keying circuit for automatic operation on the transmit-receive cycle. This type of bench test power supply has been found to be practical and economical in use. It can well eliminate the need for wet storage batteries, the care necessary in maintaining them, and the high cost of replacements.

IGNITION SWITCHING

If ignition ON-OFF control of 6/12 volt units is desired, the conversion from a standard installation can be accomplished with a minimum amount of time and effort. The following procedures apply *only* to cables supplied with the 6/12 volt units.

Current is applied to the coil of the "A" relay through the two leads of the power ON-OFF cabling and a toggle switch mounted on the control head. If a voltage dropping resistor is connected in series with the "A" relay coil, make sure it remains in series with the relay coil after the modifications are performed. The two leads of the power ON-OFF cable are either separate or combined into a two-conductor rubber, ripcord cable.

When the *two-conductor* power ON-OFF cable is used, the method is as follows (REFER TO FIGURE 1):

Disconnect the end of the power ON-OFF cable lead which is connected to the "B" or "BAT" terminal of the "A" relay. Separate the two leads of the power ON-OFF cable and reconnect the lead (which was disconnected) to the "accessories" contact on the ignition switch.

When the two leads of the power ON-OFF cable are *separate*, two types of connections may be encountered:

1) Refer to FIGURE 2. When one of the leads is connected to the "B" terminal of the "A" relay. Disconnect this lead (only) from the "B" terminal and connect it to the "accessories" contact on the ignition switch.

2) Refer to FIGURE 3. When one of the leads of the power ON-OFF cable is connected the "H" terminal of the "A" relay. Disconnect the black jumper between the "B" and "S" terminals and connect a lead from the same "S" terminal to the "accessories" contact on the ignition switch. Use #20 black insulated wire (Motorola Part No. 10M430) with a spade lug (Motorola Part No. 29R5276) on each end.

With these modifications, the control head will retain ON-OFF control but the equipment will be automatically de-energized when the ignition switch is turned "off".

ANTI-CORROSION

Corrosion of electrical connections increases circuit resistance, lowering voltage at the radio equipment and wasting battery power. System performance is lowered accordingly. Battery acid, gasoline, salt, and oil all contribute toward this corrosion.

A recently developed anti-corrosion compound has been tested by Motorola and found exceptionally effective. It contains a solvent for ease of application, and provides lasting protection of metal surfaces under severe conditions of exposure.

Benefits of the compound were evaluated by subjecting treated and untreated units to identical test conditions. Fuse blocks, "A" relays, and cable lugs were successively immersed in oil, gasoline, water, and salt and exposed to acid fumes. No corrosion was noted on parts treated with the compound. Increased contact resistance and varying degrees of pitting were found in the untreated units.

The compound has been packaged in 5 oz. lead tubes and can be ordered from any Motorola Parts and Service Depot by specifying Motorola Part No. 11T848360. » » »

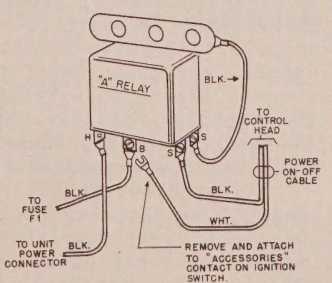


Figure 1
***Two-Conductor* Control Head Cable Used.**

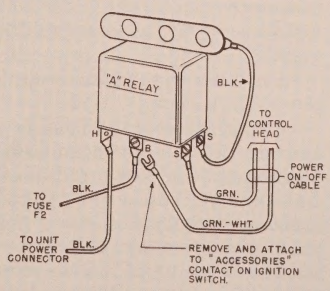


Figure 2
Two *Separate* Control Head Leads With *B* and *S* Connections On 'A' Relay.

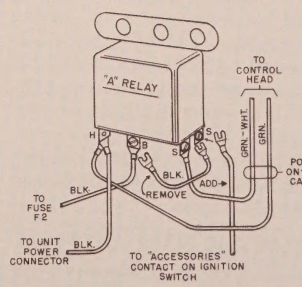
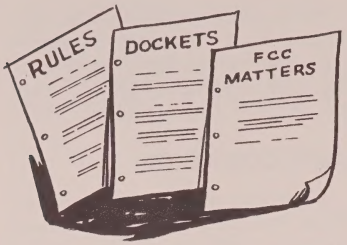


Figure 3
Two *Separate* Control Head Leads With *H* and *S* Connections On 'A' Relay.



F. C. C. BULLETINS

Excerpts from publications of and about the Federal Communications Commission

"GRANDFATHER CLAUSE" IN NEW SPECIAL INDUSTRIAL RULES

Licensees in the Special Industrial Radio Service who were authorized before Nov. 1, 1955 are advised to familiarize themselves with the new rules now governing this service. In particular, close attention should be given to Section 11.518 of the new rules, sometimes known as the "Grandfather Clause". Under the provisions of this section, persons who are properly authorized to operate in the Special Industrial services prior to Nov. 1, 1955, but who are unable to meet the eligibility requirements of the revised rules, may continue to operate indefinitely under the terms of their present authorizations. Furthermore, such licensees may modify their licenses as necessary; may renew them upon proper application; and, in the event of a change of ownership, may assign or transfer their licenses with the business for which they were granted.

There are no provisions under the new rules which allow such licenses to be reinstated once they have expired. If the present license is allowed to expire before taking steps to renew it, the licensee must re-establish his eligibility under the new rules and be governed by the restrictive permissible communications of the new rules. Therefore it behooves anyone having a license granted before Nov. 1 to see that it is not allowed to expire.

MOBILES AND FIXED ANTENNAS

The FCC receives requests from time to time for permission to employ a fixed remote antenna to temporarily extend mobile communications. Their answer has been that there is no objection to this practice as long as the mobiles are normally and primarily used with a conventional mobile antenna. This does not mean that a mobile unit may be used at a fixed location over an extended period without application being filed to license the unit as a temporary or regular base station. No specific time is quoted beyond which the mobile would assume the characteristics of a base station, however a 24-hour period might be considered a safe dividing line.

In operating a mobile transmitter into a fixed antenna, the Commission warns that the antenna must reflect the same load into the mobile transmitter as does the vehicular antenna, so that the transmitter remains properly tuned. Furthermore, a first or second class license is required in any situation which necessitates transmitter adjustments.

DROP REQUIREMENT FOR SEPARATE APPLICATIONS

In a move seen as most helpful to activities such as forestry and petroleum services, the FCC announced Jan. 12 that the filing of separate applications for each temporary base station in the land mobile services is no longer required.

In making this announcement, the FCC warned:

"It must be clearly understood that the (new) rule amendments contemplate only the consolidation of applications and authorizations, and do not mean that existing policies, which determine whether a grant of one or more transmitters at temporary locations will be in the public interest in individual cases or services, have been changed.

"No change in the Commissions requirements concerning identification, permissible communications, operator requirements, station records, notification of operation to Commission field offices, antenna structure marking, and other similar rules is intended, except where procedural changes have been necessary for clarification."

The Commission added that the amendments relate primarily to matters of internal practice and procedure and simplify the processing of applications, and that since the persons affected require no time to conform to the changes, the amendments are made effective immediately.

MOUNTING VHF ANTENNAS ON BROADCAST TOWERS

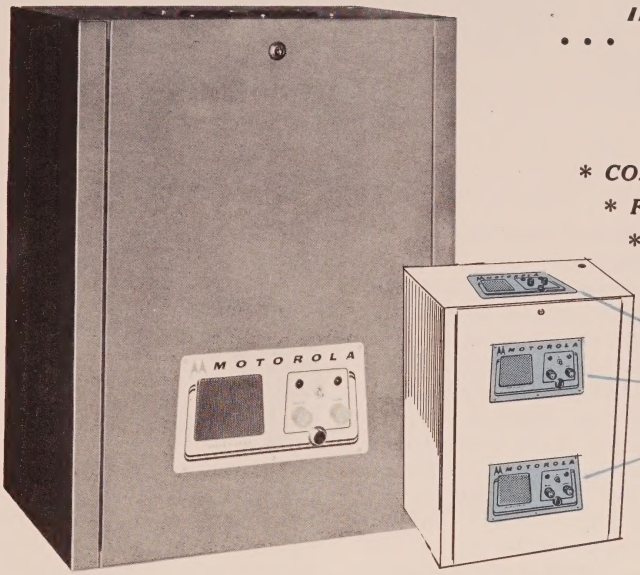
When proposing to mount a VHF antenna on the supporting structure of a standard broadcast station, it is necessary that the Broadcast licensee write a letter to the Commission requesting specific authorization for mounting the VHF antenna to the tower. The letter should state that satisfactory operation of each station will be obtained without adversely affecting the operation of the other station. In addition, if the VHF antenna is to be mounted on an AM broadcast radiator, a diagram should accompany the request, showing the complete feedline system and the location of the VHF antenna on the tower. In the case of FM or TV broadcast stations, the diagram need only show the location of the VHF antenna with respect to the FM and/or TV antenna. The letter should be submitted in duplicate and should accompany the station application.

NEW PRODUCTS

. . . "COMPA-STATION"

Transmitter-Receiver

* ***COMPACT, VERSATILE***
* ***FULL 60 WATTS RF OUTPUT***
* ***FOR BASE STATION OPERATION***



Control panel mounts interchangeably in any of three locations—alternate positions are louvered vents.

The "COMPA-STATION" transmitter-receiver, a new type base station, has been added to the Motorola product line as a complement to the upright indoor "BR", desktop "BY", and weather-proof outdoor base stations. Available in both the 25-54 and 144-174 mc. bands, this new base station features compactness and versatility of installation. It is designed for heavy duty, fixed station operation and provides a full 60 watts RF power output in both frequency bands.

CABINET

The "COMPA-STATION" transmitter-receiver is compactly packaged, measuring approximately 22" wide x 13½" deep x 29" high. The control panel can be placed in any one of three positions as illustrated, permitting a wide variety of installations. It can be mounted at desk top, desk side, or any convenient wall location. The panel contains all the necessary facilities for local control operation. Full length front and rear key-locked doors facilitate servicing and maintenance. The cabinet is attractively finished in a deep gray baked-on enamel.

EQUIPMENT

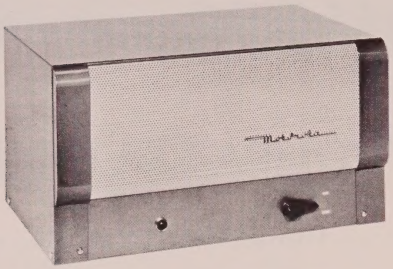
The unit incorporates an "A" transmitter, a Sensicon "G" receiver, and an A.C. power supply which operates from any standard 117 volt 60 cycle source.

The Sensicon "G" receiver incorporates the new "anti-clamp" noise-compensated squelch circuit which stays "open" when voice modulation is applied to weak or strong received signals, assuring positive reception of all messages. The cast-in-plastic *"Permakay"* filter provides "rock-stable" selectivity with minimum maintenance, and permits easy conversion to any standard channel width. Reserve gain in the I.F. stages assures continued optimum performance despite tube aging.

CONTROL FACILITIES

The "COMPA-STATION" transmitter-receiver is designed primarily for local control operation with a palm-type microphone or handset. The control panel includes volume and squelch controls, transmit and power "on" indicating lamps and a communications type speaker. However, the unit may be adapted for extended local control or remote control. The control panel can be removed and mounted in any desired location within 25 feet for extended local control. An optional remote control chassis (TU356 or TU356-C2) which mounts inside the cabinet permits remote control operation from standard Motorola remote control consoles and consolettes.

An optional TU139 Metering Panel can be mounted inside the cabinet to provide built-in metering facilities. The panel contains a 16 position rotary switch and a meter for checking all transmitter and receiver circuits essential to tuning or checking. *"Quik-Call"* equipment can also be added to provide selective calling facilities to the two-way system. » »



FM MONITOR

Auxiliary Receivers ADD Versatility

Fixed-frequency communications-type receivers can be effectively utilized in many ways. Some of the more common applications include alerting key personnel, various types of alarm systems, one-way control, remote pickup, and general monitoring.

APPLICATIONS

Receivers can be placed in the homes or cars of key personnel to assure instant contact when desired. An increasingly popular application of this type is the use of monitor receivers in the homes of volunteer firemen. The location of the fire and instructions are given over the receivers, saving precious time. QUIK-CALL equipment can be added to enable selective calling of special teams for first aid or small fires when all men and equipment are not needed.

Receivers can also be used to operate audible or visual alarm devices. Such systems are very flexible since addition, subtraction, and relocation of devices can be easily accomplished. A typical application of this type is the use of radio-operated sirens for fire and Civil Defense alarm systems. Radio provides an added measure of reliability under disaster conditions. QUIK-CALL equipment enables several communities to be selectively alarmed from a single base station.

Vehicles operating in limited areas can often be controlled from a visual vantage point which is out of voice range. In such cases, a one-way communications system utilizing "receiver only" units in the vehicles provides effective control of operations. SINGLE-TONE equipment can be added to receivers at fixed locations to remote control any number of devices such as motors, valves, transformers, etc.

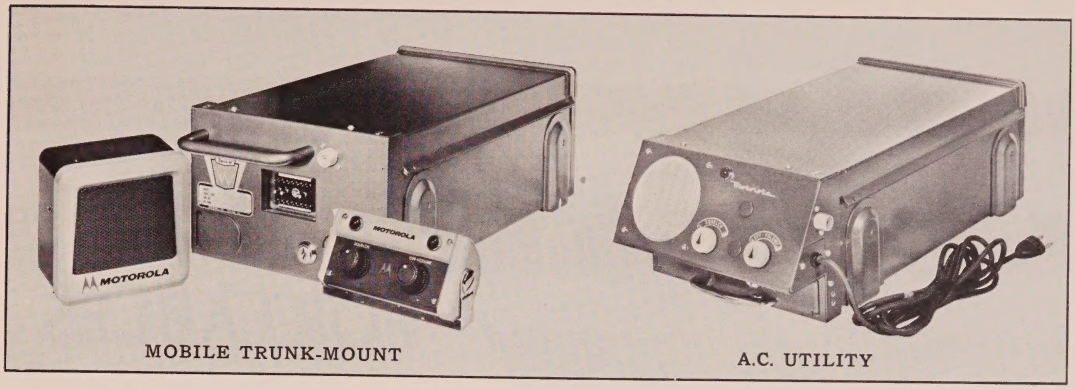
It is often practical to remotely locate a receiver from the base station and feed the audio output back to the base station over a wire line. Typical applications would be when the base station transmitter or high ambient RF noise lowers receiver sensitivity at the base station, or when "talk-back" transmissions from mobile units in certain areas are attenuated by obstructions.

Personnel not in a 2-way radio communications system may desire to monitor activities of the system. "Receiver only" units can also be used to maintain cognizance between radio systems on different channels. Typical examples would be fire and police departments of adjacent communities.

DESKTOP CABINET

CHOICE OF MODELS

Motorola offers a wide choice of fixed and mobile "receiver only" units suitable for any application. Mobile versions include dash and trunk-mounting TWIN-V radiophone models. Fixed versions operate from any standard 117 volt 60 cycle source and include A.C. utility, rack-mount, desktop cabinet, and FM monitor models.



MOBILE TRUNK-MOUNT

A.C. UTILITY

All units are engineered for top quality performance and years of dependable service.

MOBILE AND A.C. UTILITY

These compact TWIN-V radiophone models are interchangeable between 6 and 12 volt vehicles without modification. They incorporate the SENSICON receiver with its many exclusive features which include the cast-in-plastic PERMAKAY filter, "anti-clamp" noise compensated squelch, super sensitivity and selectivity, and extra IF stages for reserve gain. The dust-tight spash-proof housing is finished in dark-gray baked enamel. It has a removable top, and the drawer-unit radio set pulls out for ease in servicing. Dash mount and trunk mount models are available in both the 25-54 and 144-174 mc. bands.

A.C. utility models are identical to the dash-mount mobile units except for the A.C. operated power supply. These units are especially suited for mounting on or in desks. ON-OFF, volume and squelch controls, a power ON pilot lamp, and the speaker are conveniently built-in the front of the unit. Models are available in the 25-54 and 144-174 mc. bands.

DESKTOP CABINET

The SENSICON receiver and A.C. operated power supply are housed in an attractively styled cabinet finished in two-tone gray baked enamel. Functional controls on the front panel include a power ON-OFF switch, squelch and volume controls, a pilot light, and a speaker ON-OFF switch. An optional transformer kit provides a 500 ohm output for remote pickup applications. The unit is equipped with top and bottom access doors and a removable rear panel. Models are available in the 25-54, 144-174 and 450-470 mc. bands.

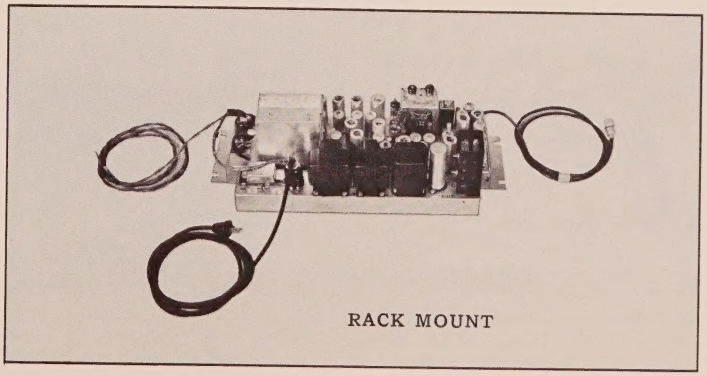
RACK MOUNT

For rack mounting applications, these models have the volume and squelch controls right on the SENSICON receiver chassis. A 6-foot length of coaxial transmission line and a 6-foot AC line cord are included for ease in installation. An optional transformer kit provides a 500 ohm output for remote pickup applications. The unit mounts on a standard 19-inch rack. Models are available in the 25-54 and 144-174 mc. bands.

FM MONITOR

This economical unit is ideally suited as a fixed-frequency home receiver for alerting key personnel. It incorporates a dual-conversion superheterodyne FM receiver circuit with single-crystal control. Volume and squelch controls are placed on the back panel to preclude tampering with proper settings.

An optional emergency 6 volt DC power supply can be mounted inside the housing. The unit automatically switches the receiver to standby power when primary power fails, and has a built-in trickle charger for the 6 volt battery. Models are available with a built-in SINGLE-TONE or QUIK-CALL decoder unit for individual or group selective calling. An attractive two-tone gray cabinet houses the receiver, AC power supply and auxiliary chassis. Models are available in the 25-54 and 144-174 mc. bands. » »



RACK MOUNT

A look at the NEW PORTABLES

NEW . . . . transistorized circuitry

NEW . . . . higher transmitter power

NEW . . . . compact, light-weight design

NEW . . . . "Permakay" Filter & "I.D.C."

NEW . . . . longer battery life

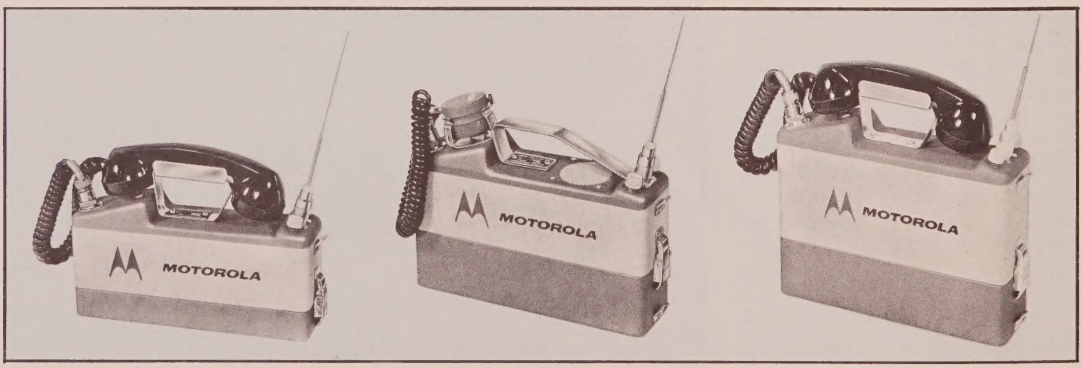
An all-new line of transistorized HANDIE-TALKIE Portable Radiophones is now available which can deliver *up to 20 times* the RF power output conventionally attained with this type of equipment. Moreover, they are smaller in size, lighter in weight and have considerably lower operating costs. Chiefly responsible for these improvements are such major circuit innovations as transistorized and plated circuitry, and advanced light-weight, long-life power packs.

The new portable radiophones are divided into two general classifications, the "H" Series and "P" Series. Models are available in both series for either 25-54 mc. or 144-174 mc. operation, with choice of 1 or 2 transmitting frequencies, choice of 3 types of power packs, and choice of either handset microphone or built-in speaker and palm type microphone.

MODELS

"H" Series models are designed for maximum portability applications where light weight and compact size are the prime considerations. These models provide from 1 to 1.5 watts of RF power output, depending on frequency band, and weigh as little as 7½ pounds.

The "P" Series models are distinguished by highest RF power output in portables. Models in the 25-54 mc. band develop from 6 to 8 watts RF power output, depending on type of power pack used. Models in the 144-174 mc. band have 4 to 5 watts RF power output.



"H" Series Models: (1) Handset version with standard battery pack; (2) Speaker-microphone model with extra-duty battery pack; (3) two-transmitter model with Nickel-Cadmium, 6/12 volt, power pack.

In all, 42 models are available—30 in the "H" Series, and 12 in the "P" Series. Variations are in the type of microphone speaker facilities, type of power pack supplied, number of transmitting frequencies, and frequency of operation, a model for every application.

FEATURES

A large number of features incorporated in the new "HANDIE-TALKIE" Portable Radiophones are making their initial appearance in equipment of this type. Among these are the introduction of transistors in all I.F. and audio stages. The qualities of reliability, miniature size, and low power consumption, inherent in transistors, are utilized to their fullest extent in portable equipment of this type. They account not only for substantial reductions in size and weight, but also for longer lasting trouble-free performance and lower operating costs.

Also contributing towards the reduction in size and weight are such factors as miniaturized components, modular circuit construction methods, the Motorola patented "PLA-cir" method of plated circuit chassis construction, an all-aluminum drawn housing and the newly developed light-weight power packs. The result is a unit lighter in weight, smaller and more compact, and yet with improved quality, greater performance and easier serviceability.

Features found in the "big sets" are also included in the new portables. These include transmitter "I.D.C." (Instantaneous Deviation Control), which automatically limits transmitter deviation to FCC channel width requirements; receiver "Permakay" IF Wave Filter, which allows easy transition to future "split-channel" operation while minimizing all types of unwanted interference; unique construction methods, which allow simple changes from 25-54 mc. to 144-174 mc. operation, or vice versa, and permits future replacement of vacuum tube modules with equivalent transistor modules.

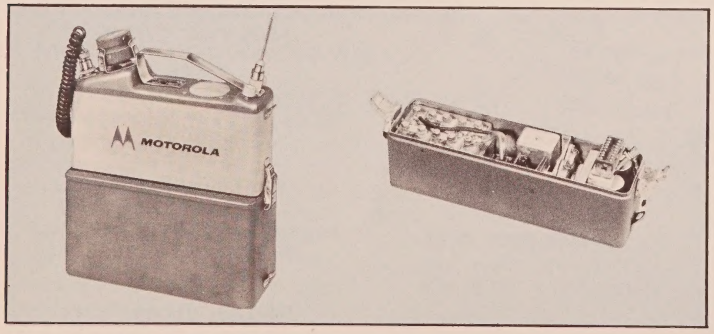
POWER PACKS

A wide selection of quick-interchange, "snap-on" power supplies are available for virtually any field operation requirement. These include the replaceable dry cell versions (standard or extra-duty); life-time rechargeable wet cell batteries; and, power supplies operated from an external 117 volt AC source.

The standard dry cell battery supplies can be operated 2 full working days between battery changes. The extra-duty dry cell battery pack can be operated *5 full working days,* assuming the normal 10% transmitter duty cycle.

Nickel-cadmium, life-time rechargeable wet cell batteries are now the new standard in rechargeable power packs. These new batteries are used in a completely transistorized power pack which eliminates vibrators completely. Another outstanding feature of this pack is its ability to permit universal operation of the radio unit from an *external* 6 or 12 volt storage battery to conserve internal batteries when operating in a vehicle and, at the same time, trickle charging the internal batteries.

Also available for snap-on attachment to the radiophone, is a 117 VAC operated power pack which may be used for auxiliary fixed or emergency applications.



"P" Series Models: (1) with extra-duty dry cell power pack and 1-frequency transmitter-receiver (all "P" Series models are equipped with speaker-microphone facilities); (2) interior view of Nickel-cadmium, 6/12 volt power pack.

One of the major applications of the portable HANDIE-TALKIE Radiophone is in the public safety and plant protection fields. Others include forestry, railroad, construction and military activities.

SERVICEABILITY

The new "HANDIE-TALKIE" Radiophone has many new features which are of special interest to the serviceman. The transmitter and receiver chassis are mounted on convenient swing-out subassemblies to permit complete accessability to all components, thus permitting alignment and maintenance operations to be greatly facilitated. Quarter-turn metal fasteners are used to simplify access to the internal transmitter-receiver circuits. Snap-on battery compartments accelerate normal power supply maintenance. All replacement batteries are of easily obtainable standard types.

EXTERNAL CONTROLS

Another innovation on all new models is the placement of the volume and squelch controls on the exterior front panel, for ready accessability. The controls are now situated where they may be adjusted instantly.

Still another new feature is the handset (or microphone) actuated automatic "OFF" switch. The radiophone unit is automatically turned "off" when the microphone is returned to its hang-up bracket. The "on" function is manually controlled to conserve battery life.

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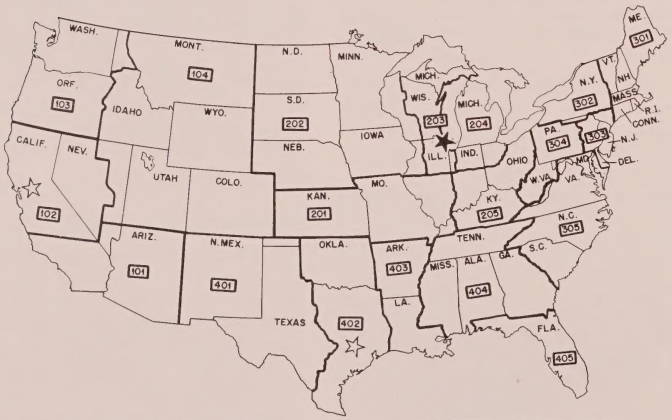

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SPAULDING 2-6500

Army Ordnance Officers Study Motorola Management Techniques

Five top Ordnance Lt. Colonels are now studying management techniques and policies at Motorola as part of an executive training program instituted by the Army Ordnance Corps. Motorola was one of five Chicago corporations selected as ideal training grounds for these senior officers, who are preparing for top management assignments in the Corps. Besides spending three months at Motorola and each of the four other corporations, the officers are attending a 21-month Executive Program at the University of Chicago at night.

As part of their training, individual officers will discuss completed management studies with members of management and assist department heads in completing studies (wherever practical) which will be used in making management decisions.

After completion of this training, the officer-executive will head arsenals, ordnance districts, depots and proving grounds, with responsibilities and administrative functions closely resembling those of the industrial executive. » » »

Listening intently to Bob Galvin, Vice-President of Motorola, Inc., are (left to right) Lt. Col. Herbert R. Dichtenmuller, Lt. Col. Charles M. Prosser, Lt. Col. Joseph M. Heiser Jr., and Lt. Col. Burleigh B. Drummond. Lt. Col. William Sloan, not shown, is the fifth member of the group.

A Motorola Maintenance Aid . . .

SERVICE CLINICS

A continuing program of service clinics during 1956 is one of the contributions being made by Motorola's National Service Department to the development of better maintenance techniques by customer technicians and Motorola Service Stations. Above is a photo taken of those who attended a clinic at Orlando, Florida, Jan. 23-24. This was the first of a series of clinics held in the States of Florida, Georgia and Alabama during January. Clinics will be held in the following cities during the next few months:

APRIL: *Charlotte, Richmond, Baltimore*

MAY: *Pittsburgh, Philadelphia, Syracuse*

JUNE: *Hartford, Conn.; Boston; Montpelier, Vt.*

Motorola Investigating 900 mc. Band for Land Mobile Service Use

As the result of a petition filed with the Federal Communications Commission last year, Motorola has received approval to make tests to determine the practicability of using a portion of the 900 mc. band for land mobile radio service.

Specifically, the company received an experimental grant to operate 10 mobile units on the frequencies of 900.6 and 930.6 mc. to collect data on wave propagation, power requirements, channel spacing and other points which must be considered for the development of mobile service.

When filing the petition, Motorola pointed out that consideration of the need for land mobile services below 1000 mc., when weighed with the spectrum space available for the fixed services above 1000 mc., makes it evident that it is not in the public interest to permanently allocate the entire 890-960 mc. band for fixed operation. » » »

FINEST RADIO

Acceptance—Motorola supplies more 2-way radios than *all* other manufacturers *combined*.

Experience—Motorola has been the unchallenged leader in the two-way radio industry since its inception.

Engineering Skill—The world's largest engineering staff and laboratories devoted exclusively to FM 2-way radio.

Reputation—An outstanding record of customer satisfaction; ask any Motorola user.

Obsolescence Insurance—Foolproof 6/12 volt interchangeability for mixed fleets of 6 and 12 volt vehicles.

Longest Life—Proved in use, again and again, to outlive any other.

Reception—New **Twin-V** radiophone assures finest reception yet achieved.

COMPLETE FINANCING and LEASING

The broadest selection of purchase-finance plans, the best program for any fleet readily available.

Lease with equity; accrue ownership while you rent, or lease economically without equity.

Optional installation and maintenance contracts; Motorola assumes complete maintenance responsibility, combined with lease-purchase plans if you desire for single responsibility, single billing.

FOR EVERY APPLICATION

The most complete line of mobile radio for operation on any communications frequency.

Motorola microwave provides voice, teleprinter and facsimile for efficient, effective administrative message traffic.

COMPLETE SERVICE

More than 200 Radio Communications Engineers to help you plan your communications system.

Full initial and continuing "call-back" customer service on FCC licensing, equipment selection, equipment maintenance, operational assistance and training.

Service Aids—factory and field clinics and published informational data for maintenance personnel.

More than 750 independent, factory supervised, Motorola service stations throughout the country for contract maintenance anywhere.

Factory trained maintenance technicians.

Strategically located parts depots for rapid service on genuine Motorola replacement parts.

write, phone or wire TODAY
a Motorola Communications Engineer will give you all the facts

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